



# Project Management

MGT 30725

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# Lesson 7 – The Project Budget

## Agenda

- Estimate Costs and income
- Creating a Preliminary Budget
- Budget and Schedule Balancing

# Learning Objectives

- Understand the importance of project cost management
- Explain basic project cost management principles, concepts, and terms
- Describe the process of planning cost management
- Discuss different types of cost estimates and methods for preparing them

# Learning Objectives

- Understand the processes of determining a budget and preparing a cost estimate for a project
- Understand the benefits of earned value management and project portfolio management to assist in cost control
- Describe how project management software can assist in project cost management

# What is Cost and Project Cost Management?

- **Cost** is a resource sacrificed or foregone to achieve a specific objective or something given up in exchange
- Costs are usually measured in monetary units like dollars
- **Project cost management** includes the processes required to ensure that the project is completed within an approved budget

# Estimate Costs and income

- Ensure that the project is **completed within budget**
- Concerned with cost of resources needed to complete activities; consider effect of project decisions on cost of using product “life-cycle costing”
- Consider information needs of stakeholders, controllable and uncontrollable costs (budget separately for reward and recognition systems)
- Involve in estimating, budgeting & controlling cost so that the project can be completed within the approved budget

# Project Cost Management Processes

- **Planning cost management** :determining the policies, procedures, and documentation that will be used for planning, executing, and controlling project cost.
- **Estimating costs**: developing an approximation or estimate of the costs of the resources needed to complete a project
- **Determining the budget**: allocating the overall cost estimate to individual work items to establish a baseline for measuring performance
- **Controlling costs**: controlling changes to the project budget



# Project Cost Management Summary

## Planning

Process: **Plan cost management**

Outputs: Cost management plan

Process: **Estimate costs**

Outputs: Activity cost estimates, basis of estimates, project documents updates

Process: **Determine budget**

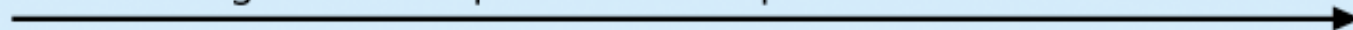
Outputs: Cost baseline, project funding requirements, project documents updates



## Monitoring and Controlling

Process: **Control costs**

Outputs: Work performance information, cost forecasts, change requests, project management plan updates, project documents updates, organizational process assets updates



Project Start

Project Finish





# Basic Principles of Cost Management

- Most members of an executive board better understand and are more interested in financial terms than IT terms , so IT project managers must speak their language
  - **Profits** are revenues minus expenditures
  - **Profit margin** is the ratio of revenues to profits
  - **Life cycle costing** considers the total cost of ownership, or development plus support costs, for a project
  - **Cash flow analysis** determines the estimated annual costs and benefits for a project and the resulting annual cash flow

# Types of Costs and Benefits

- **Tangible costs or benefits** are those costs or benefits that an organization can easily measure in dollars
- **Intangible costs or benefits** are costs or benefits that are difficult to measure in monetary terms
- **Direct costs** are costs that can be directly related to producing the products and services of the project
- **Indirect costs** are costs that are not directly related to the products or services of the project, but are indirectly related to performing the project
- **Sunk cost** is money that has been spent in the past; when deciding what projects to invest in or continue, you should *not* include sunk costs

# More Basic Principles of Cost Management

- **Learning curve theory** states that when many items are produced repetitively, the unit cost of those items decreases in a regular pattern as more units are produced
- **Reserves** are dollars included in a cost estimate to mitigate cost risk by allowing for future situations that are difficult to predict
  - **Contingency reserves** allow for future situations that may be partially planned for (sometimes called **known unknowns**) and are included in the project cost baseline
  - **Management reserves** allow for future situations that are unpredictable (sometimes called **unknown unknowns**)

# Planning Cost Management

- The project team uses expert judgment, analytical techniques, and meetings to develop the cost management plan
- A cost management plan includes:
  - Level of accuracy and units of measure
  - Organizational procedure links
  - Control thresholds
  - Rules of performance measurement
  - Reporting formats
  - Process descriptions

# Estimating Costs

- Project managers must take cost estimates seriously if they want to complete projects within budget constraints
- It's important to know the types of cost estimates, how to prepare cost estimates, and typical problems associated with cost estimates

# Estimate Costs

- The process of developing approximation of the monetary resources needed to complete project activities.
  - Cost trade-offs & risk must be considered
  - Cost estimates should be refined

Type of Estimate	When Done	Why Done	How Accurate
<b>Rough Order of Magnitude (ROM)</b>	Very early in the project life cycle, often 3–5 years before project completion	Provides rough ballpark of cost for selection decisions	–25%, +75%
<b>Budgetary</b>	Early, 1–2 years prior to project completion	Used to allocate money into an organization's budget	–10%, +25%
<b>Definitive</b>	Made one year or less prior to project completion	Provides details for purchases, estimate actual costs	–5%, +10%

# Estimate Costs and income

## Cost estimating techniques - Analogous Estimating

- Estimating the **cost** of an activity or a project using **historical** data from a **similar activity** or project.
- Used when **limited knowledge** is available.
- Generally **less costly** and **less time consuming** than other techniques, but it is also **less accurate**
- Form of **expert judgment**

## Cost estimating techniques - Parametric Estimating

- Uses a statistical relationship between historical data and other variables to calculate an estimate for activity.
- This technique can produce higher levels of accuracy  
**e.g.** house costs \$115/sqft, or office building cost \$254/sqft, software development costs \$3 per line of code, etc..  
**e.g.** activity duration on a design project is estimated by the number of drawings multiplied by the number of labor hours per drawing



# Estimate Costs and income

## Cost estimating techniques - Three-Point Estimating (PERT)

- Also called Program Evaluation and Review technique (PERT)
- Use for time and cost estimation

time O - most optimistic (shortest) estimate

time M - most likely (average or frequent) estimate

time P - most pessimistic (longest) estimate

Activity	Duration			Expected Duration (PERT)
	P	M	O	
A	8	5	1	
B	8	4	2	
C	15	8	5	
D	20	10	5	
Project (Total)	-			

Expected

$$\frac{P + 4M + O}{6}$$

# Typical Problems with Cost Estimates

- Estimates are done too quickly
- People lack estimating experience
- Human beings are biased toward underestimation
- Management desires accuracy

# Determining the Budget

- Cost budgeting involves allocating the project cost estimate to individual work items over time
- The WBS is a required input to the cost budgeting process since it defines the work items
- Important goal is to produce a **cost baseline**
  - a time-phased budget that project managers use to measure and monitor cost performance

# Creating a Preliminary Budget

## Reserve Analysis

- Duration estimates include Contingency Reserves (time reserves/buffers), to account for schedule uncertainty.
- Contingency reserves are the estimated duration within the **schedule baseline, which is allocated for identified risks** that are accepted and for which contingent or mitigation responses are developed.
- These are associated with the “**known-unknowns**,” which may be estimated to account for this **unknown amount of rework**.

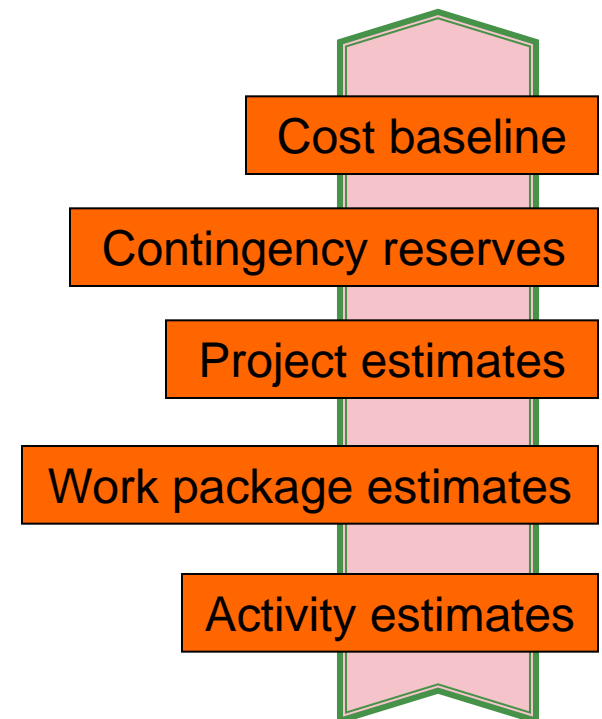
# Creating a Preliminary Budget

## Determine Budget

- Process of **aggregating** the estimated cost of individual activities or work packages to establish an authorized **cost baseline**.

## Cost Baseline

- The cost baseline is the approved version of the time-phased project budget, **excluding any management reserves**.
- This can only be changed through **formal change control procedures** and is used as a basis for comparison to actual results.
- **Management reserves** are added to the cost baseline to produce the project budget.



# Controlling Costs

- Project cost control includes
  - Monitoring cost performance
  - Ensuring that only appropriate project changes are included in a revised cost baseline
  - Informing project stakeholders of authorized changes to the project that will affect costs
- Many organizations around the globe have problems with cost control

# Earned Value Management (EVM)

- **EVM** is a project performance measurement technique that integrates scope, time, and cost data
- Given a **baseline** (original plan plus approved changes), you can determine how well the project is meeting its goals
- You must enter actual information periodically to use EVM
- More and more organizations around the world are using EVM to help control project costs



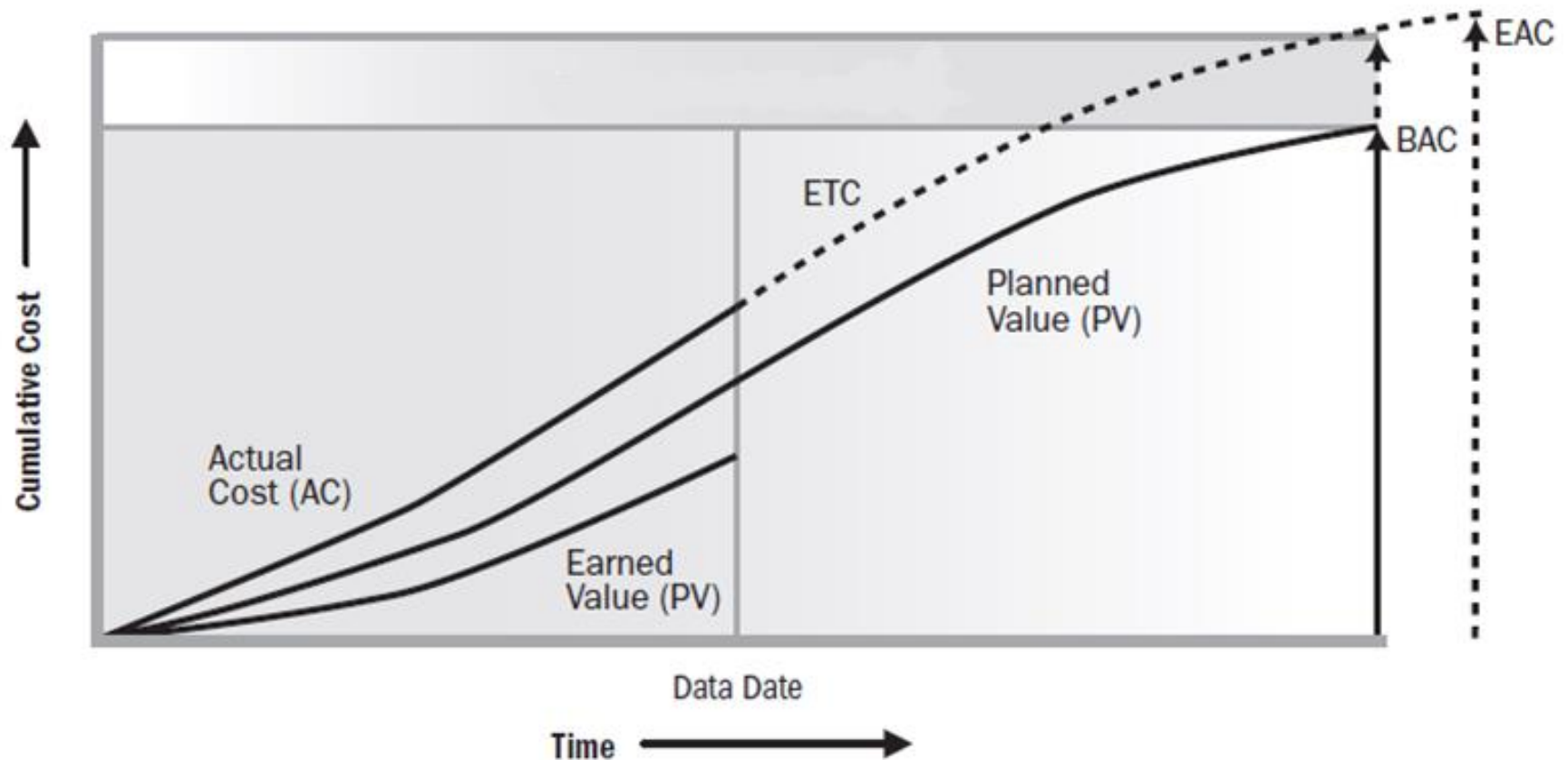
# Earned Value Management Terms

- The **planned value (PV)**, formerly called the budgeted cost of work scheduled (BCWS), also called the budget, is that portion of the approved total cost estimate planned to be spent on an activity during a given period
- **Actual cost (AC)**, formerly called actual cost of work performed (ACWP), is the total of direct and indirect costs incurred in accomplishing work on an activity during a given period
- The **earned value (EV)**, formerly called the budgeted cost of work performed (BCWP), is an estimate of the value of the physical work actually completed
- EV is based on the original planned costs for the project or activity and the rate at which the team is completing work on the project or activity to date

# Budget and Schedule Balancing

## Earned Value Management Terms

- The three parameters of PV, EV and AC can be monitored and reported. A S-curves can be used to present these three parameters.



# Budget and Schedule Balancing

## Example

- In a garden clean up project, we should have completed \$800 worth of work by today. But we have only completed \$600 worth of work as of today. We paid the contractor \$700 up to today.
  - What is PV, EV and AC
  - Are we doing the project better? Justify your answer

# Budget and Schedule Balancing

- **Schedule Variance (SV)**, is the amount by which the project is ahead or behind the planned delivery date, at a given point in time.
- The EVM schedule variance is a useful metric in that it can indicate when a project is falling behind or is ahead of its baseline schedule.

$$SV = EV - PV$$

- **Cost variance (CV)**, is the amount of budget deficit or surplus at a given point in time.
- It is a measure of cost performance on a project.

$$CV = EV - AC$$

# Budget and Schedule Balancing

- **Schedule Performance Index (SPI)**, measures how efficiently the project team is using its time.
- An **SPI value less than 1.0** indicates less work was completed than was planned. An **SPI greater than 1.0** indicates that more work was completed than was planned.

$$SPI = EV/PV$$

- **Cost Performance Index (CPI)**, is considered the most critical EVM metric and measures the cost efficiency for the work completed.
- A CPI value of **less than 1.0** indicates a cost overrun for work completed. A CPI value **greater than 1.0** indicates a cost underrun of performance to date.

$$CPI = EV/AC$$

# Budget and Schedule Balancing

## Earned Value Management (EVM)

Performance Measures		Schedule		
		$SV > 0 \text{ \& } SPI > 1.0$	$SV = 0 \text{ \& } SPI = 1.0$	$SV < 0 \text{ \& } SPI < 1.0$
Cost	$CV > 0 \text{ \& } CPI > 1.0$	Ahead of Schedule Under Budget	On Schedule Under Budget	Behind Schedule Under Budget
	$CV = 0 \text{ \& } CPI = 1.0$	Ahead of Schedule On Budget	On Schedule On Budget	Behind Schedule On Budget
	$CV < 0 \text{ \& } CPI < 1.0$	Ahead of Schedule Over Budget	On Schedule Over Budget	Behind Schedule Over Budget

# Budget and Schedule Balancing

## EVM

<u>Example:</u> Project Budget: \$400K Project Schedule: 4 months	At the 3 month checkpoint: Spent: \$200K Work completed: \$100K
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Terms and Formulas	Definition	Example
Earned Value (EV)	As of today, what is the estimated value of the work actually accomplished?	\$100K
Actual Cost (AC)	As of today, what is the actual cost incurred for the work accomplished?	\$200K
Planned Value (PV)	As of today, what is the estimated value of work planned to be done?	\$300K
Cost Variance (CV) = EV - AC	Negative is over budget Positive is under budget	\$100K – \$200K = (\$100K)
Schedule Variance (SV) = EV - PV	Negative is behind schedule Positive is ahead schedule	\$100K - \$300K = (\$200K)
Cost Performance Index (CPI) = EV/AC	We are getting \$__ worth of work out of every \$1 spent. Are funds being used efficiently?	\$100K/\$200K = 0.5 i.e. 50%
Schedule Performance Index (SPI) = EV/PV	We are (only) progressing at __ percent of the rate originally planed	\$100K/\$300K = 0.33 i.e 33%
Revised Total Duration	Baseline Duration/Schedule Performance Index	4/0.33 = 12 months



# Lesson 8 – The Project Quality

## Agenda

- Meeting the requirements with Project Quality Management